Government of Alberta
Environment

GUIDELINES FOR SUBMISSION OF A PRE-DISTURBANCE ASSESSMENT And CONSERVATION & RECLAMATION PLAN (PDA/C&R Plan)

Under an Environmental Protection and Enhancement Act Approval

For an

Enhanced Recovery In-Situ Oil Sands and Heavy Oil Processing Plant and Oil Production Site

ALBERTA ENVIRONMENT
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1.0 OVERVIEW

The Guidelines for Submission of a Pre-Disturbance Assessment and Conservation & Reclamation Plan (PDA/C&R Plan) serves to standardize the collection and reporting of Pre-Disturbance Assessment data as well as the Conservation & Reclamation Plans supported by the data. The guidelines address methodology and content for PDA/C&R Plans submitted to Alberta Environment (AENV). The guidelines also provide a checklist for PDA/C&R Plan content and submission requirements. The goals of this document are to:

- assist approval holders in standardizing procedures, planning, and reporting for PDA/C&R Plans;
- provide specific guidelines for data collection, reporting and conservation & reclamation planning to approval holders;
- support preparation and submission of consistent PDA/C&R Plans; and
- facilitate Alberta Environment's review of PDA/C&R Plans.

The PDA/C&R Plan is a document that is required under an *Environmental Protection and Enhancement Act* (EPEA) Approval for an Enhanced Recovery In-situ Oil Sands and Heavy Oil Processing Plant and Oil Production Site. The PDA/C&R Plan is required to provide site-specific information regarding the construction, operation, and reclamation of specific footprint components of the overall project. The PDA/C&R Plan provides details regarding baseline biophysical conditions, the proposed disturbance footprints, and the steps that will be taken during the various phases of construction, operation and reclamation to ensure that the disturbed areas will be reclaimed to an equivalent land capability as defined in the *Conservation & reclamation Regulation*.

2.0 REGULATORY REQUIREMENT FOR THE PDA/C&R PLAN

The intent of the PDA/C&R Plan is to ensure that pre-disturbance biophysical conditions are identified and documented prior to any land disturbance and to ensure that appropriate site-specific conservation & reclamation measures are planned and implemented. It is the intent of these assessments to identify:

- any sensitive environmental conditions as they pertain to soil and vegetation;
- appropriate mitigation and conservation measures; and
- the reclamation activities to be undertaken at the end of the facility life.

Where an EPEA Approval has been issued for an Enhanced Recovery In-situ Oil Sands and Heavy Oil Processing Plant and Oil Production Site, PDA/C&R Plans must be completed for each land disturbance being developed pursuant to the EPEA Approval, which typically states:

> *Unless otherwise authorized in writing by the Director, at least 6 months prior to any land disturbance, the approval holder shall provide the following to the Director for his authorization:*
>
> (a) *a detailed Development Plan illustrating the locations of all facilities proposed for construction, including central processing facility sites, well pads, roads, borrow pits and any other infrastructures;*
>
> (b) *a detailed Pre-Disturbance Assessment that includes:*
>
> (i) *soil,*
>
> (ii) *topography, and*
>
> (iii) *vegetation, including rare plants and wetlands;*
>
> (c) *a classification of pre-disturbance conditions for affected lands using Land Capability Classification for Ecosystems in the Oil Sands , 3rd Edition, Alberta Environment, 2006, as amended; and*
>
> (d) *a detailed, site-specific Conservation & reclamation Plan.*

Whenever possible, PDA/C&R Plans should be submitted based on a phase of development, a time period of development (e.g., annual), or on groupings of land disturbances within a geographical area.

Some types of land disturbances that involve only minor surface disturbance are not intended to be addressed by this EPEA Approval condition unless they are included within an area of particular ecological sensitivity or significance. Some examples may include:

- a single land disturbance requiring less than one (1) hectare (ha) of area (multiple small disturbance areas may be considered a project that requires a PDA);
- facilities requiring only vegetation removal;
- expansion or modification of existing roads, pipelines, or power lines within existing rights-of-way;
- test holes or pits for survey and investigation to determine location suitability (e.g., road alignments, water crossings, borrow pits, and facility siting);
- minor soil disturbances located in the immediate vicinity of a building to provide access and limited parking space for the users of the building;
- soils disturbance for the purpose of environmental monitoring and assessment (e.g., air monitoring station, groundwater monitoring wells);
- emergency response (e.g., grading for fire breaks, contaminant containments, monitoring wells for the purpose of assessing failures);
- soils disturbances with the objective of decreasing potential environmental impacts (e.g., groundwater remediation trench);
- mitigative measures against the impacts of facility operations on livestock or wildlife (e.g., fencing); and
- source water wells.

Such exceptions should be confirmed by AENV and be documented in the Annual C&R Report.

Note: The PDA/C&R Plan does not address requirements under any other legislation or EPEA Approval condition. Any "Director Authorizations" sought under any other Section of the EPEA Approval must be addressed under separate cover.

3.0 PLANNING CONSIDERATIONS

3.1 REQUIREMENTS OF PDA/C&R PLAN ASSESSORS

All aspects of a PDA/C&R Plan, including on-site data collection, analysis and reporting of the data, and development of the C&R Plan must be completed by qualified personnel. The PDA/C&R Plan must be signed by those professionals responsible for the report. Recommended qualifications of assessors are provided as a guide to assist in the selection of suitable individuals for the completion of PDA/C&R Plan assessments and reports. The following are some of these recommended qualifications and knowledge skill sets. This list is not all-inclusive and other qualifications could be considered:

- experience and/or education in Earth/Biological/Environmental Sciences or related fields;

- experience working in the Boreal Region of Alberta and a background or education in that biophysical setting;
- background and/or education in conservation & reclamation or related fields;
- experience working in Alberta combined with experience in the surface construction industry;
- knowledge and understanding of Alberta legislation as it applies to public land in Alberta;
- knowledge and understanding of Alberta policies, land-use planning documents, and guidelines; and
- knowledge and understanding of federal legislation as it applies within Alberta.

3.2 REVIEW OF BACKGROUND INFORMATION

Background information should be used as a planning tool for the development of the on-site assessment and as the framework for developing the baseline and biophysical setting of the PDA/C&R Plan.

Common background information may include, but not limited to, the Environmental Impact Assessment (EIA), the EPEA Approval document, construction diagrams supplied by the company, rare plant occurrences (based on Alberta Natural Heritage Information Centre (ANHIC) review), soil survey information, aerial photographs, Alberta Vegetation Inventory (AVI) data, Alberta Wetlands Inventory (AWI) data, C&R plans from EIAs and EPEA Applications, regional vegetation (or ecosite) surveys, information regarding existing disturbances or previously disturbed lands, and other relevant documents.

3.3 PLANNING FOR A PRE-DISTURBANCE ASSESSMENT

The objective of the planning phase of the PDA/C&R Plan is to understand clearly what proposed land disturbances are included in the assessment and where those proposed disturbances will be located. Detailed information and planning regarding disturbance footprint, timing and construction should be completed prior to the initiation of the PDA/C&R Plan. Facility footprint and placement should be near its final stage of development in order to effectively complete the on-site field assessment. Consideration of factors such as geotechnical design, resource identification, supporting infrastructure, and environmental constraints should be included during the initial planning for the PDA/C&R Plan.

During the planning of the PDA/C&R Plan, the development of a suitable on-site assessment including what information should be collected during the on-site assessment and the methodology by which that assessment should occur is critical.

Changes to disturbance footprints following the on-site assessment for the PDA/C&R Plan may lead to insufficient data collection or gaps in the development of detailed conservation & reclamation plans. It may be useful to conduct the PDA/C&R Plan site assessment on an area that is larger than that required for the proposed land disturbance. This approach facilitates

minor changes to disturbance locations while still allowing the site-specific data requirements outlined in the guidelines to be achieved.

3.4 SUBMISSION OF THE PDA/C&R PLAN

A completed PDA/C&R Plan consists of a report specific to the proposed disturbance and applicable plans and attachments (appendices). These items must be submitted for all proposed disturbances; and multiple disturbances should be combined under a single cover document, if possible. In fact, whenever possible, PDA/C&R Plans should be conducted and submitted based on land disturbance groupings by geographical area, phase of development, or period of development (e.g., annual).

When completing a PDA/C&R Plan, the following should be considered to assure thoroughness, completeness, and adherence to EPEA Approval conditions:

- the Approval holder must provide site-specific details regarding the environmental issues that need to be addressed during the construction, operation and reclamation phases of the project; and
- the Approval holder is responsible for the submission of a completed PDA/C&R Plan prior to the start of construction as outlined in the EPEA Approval.

4.0 ON-SITE DATA COLLECTION REQUIREMENTS AND METHODOLOGY

The intent of this section is to define what information should be collected for the PDA/C&R Plan and the methodologies that should be followed for collecting the information.

4.1 THE SOIL SURVEY

The Mapping System Working Group (1981) defines the soil survey as the process of assembling a soil resource inventory of an area. This process includes the initial planning, field investigations, soil and site descriptions, sample collection and analysis, interpretation and report preparation. The purpose of the soil survey in the context of a PDA/C&R Plan is to provide an accurate inventory of soils to assist in the determination of the most appropriate soil salvage and reclamation plan for the proposed disturbances. As a means of expressing the soils inventory for the purpose of the PDA/C&R Plan, a soil map is required. Given this purpose and the inherent variability of soil in the In-Situ Oil Sands area of the Boreal Forest Natural Region, the recommended map scale is 1:5000 or greater which corresponds to a minimum mappable unit of 0.125 ha (0.5 cm^2 on the map) (Mapping System Working Group 1981). The Mapping System Working Group (1981) provides further details on the procedures needed for the development of soil surveys and maps.

The collection of soil information on the proposed disturbance area must meet the required soil inspection density as specified in Table 1 in order to adequately characterize the variability of the site conditions within the minimum mapping scale of 1:5,000 (larger scales such as 1:2,000 can also be used).

4.1.1 Survey Intensity Level and Soil Inspection Density

The Mapping Systems Working Group (1981) uses a Survey Intensity Level (SIL) system to define the general purpose and scale (precision) of the soil survey map. The Working Group has identified five levels of survey intensity with Level 1 (SIL 1) having the highest intensity and precision and Level 5 (SIL 5) the lowest. For the purpose of a soil resource inventory in the PDA/C&R Plan, the level of detail and precision actually required to support a thorough site assessment and conservation & reclamation plan is considerably greater than SIL 1. Survey intensity for the PDA/C&R Plan should exceed the highest soil survey intensity within SIL 1 to provide adequate data to support the detailed, site-specific C&R Plan. Soil Inspection Density is a parameter that determines Survey Intensity Level and is the total number of hectares mapped divided by the number of site inspections. The appropriate soil inspection density will depend on the map scale, existing information, variability of soils and to a certain extent on the experience of the soil surveyor.

The required minimum soil inspection density level criteria for footprint areas are presented in Table 1. The criteria are based on establishing a suitable spatial density of inspection sites on footprint areas to characterize the baseline soil conditions and capture the natural variability including topsoil thickness.

Within each disturbance area, a range of acceptable inspection densities are presented. On naturally uniform sites, a lower soil inspection density is acceptable. For sites with a high natural variability, the higher density is required. For example, on a 4 ha facility, with uniform slopes and soil types, a density of 0.24 ha/site would be acceptable. For the same size of facility with undulating to hummocky slopes and variable soil types, an inspection density of 0.15 ha/site is required. Suitable soil inspection densities can be determined in the field by the on-site qualified assessor.

In proposed linear rights-of-way, inspections are to be conducted at a minimum of one site per 100 metres (m). One site per 100 m is an average inspection density, and the actual spacing between inspections can vary. An inspection site should be located within each different soil or vegetation type along a linear development, and in complex terrain the soil inspection density may be somewhat greater than one per 100 m.

The criteria ranges in Table 1 were tested statistically on topsoil thickness data previously submitted in earlier PDA/C&R Plans. The analyses of 95% confidence intervals compared to ±20% of the average thickness confirmed that criteria ranges would provide enough sample numbers to adequately describe the variability of soils on a wide variety of different sites that contained a range of upland and organic soils.

Mapping will be done at a soil series level using the Alberta Soil Names File (Generation 3) User's Handbook (2006) as a guide to determining and describing soil series names.

Soil inclusions within map units will be based on soil inspections and overall observations made by the surveyor. Soil inspections will be placed in locations that best describe the soil terrain unit and possible inclusions. Mapping of inclusions will follow Table 7 (the treatment of map unit components according to their areal extent and contrasting characteristics) of the Mapping System Working Group (1981) guidelines. Section 4.8 of this document along with Table 7 should be used to discern inclusions based on contrasting characteristics defined in Section 4.4 of the Mapping System Working Group (1981) guidelines. For example, Table 7 indicates that a soil having dissimilar and limiting contrasting characteristics (such as a deep organic soil) occupying less than 10% of all the delineations of a map unit predominantly comprised of orthic gray luvisol soil would be an "undescribed inclusion" and would not be presented and used as a diagnostic feature of this map unit.

Table 1: Required Soil Inspection Density

Size of Disturbance* (ha)	**Density** (ha/inspection site)	**Total Inspections**
1-2	0.10-0.14	7-20
3-6	0.15-0.24	13-40
7-11	0.25-0.34	21-44
12-16	0.35-0.44	27-46
17-23	0.45-0.54	31-51
24-35	0.55-0.64	38-64
36-45	0.65-0.74	49-69
>45	0.75-1.0	>45
Linear Disturbance	100 m/site	

* disturbance footprint sizes falling in between the presented hectare (ha) ranges should be rounded up to the nearest ha to determine the required density category (e.g. a 2.5 ha disturbance would be rounded to 3 ha and the corresponding density requirement would be 0.15-0.24 ha/inspection site)

4.1.2 Soil Inspection Sites and Methods

All soil inspection sites should be recorded with a GPS device. As described in the *Land Capability Classification of Forest Ecosystems in the Oil Sands Region, 3rd Edition* (Alberta Environment 2006, as amended) the following sample strategy should be applied to the gathering of soil and terrain information for the PDA/C&R Plan.

Stratified sampling (stratification) is based on a conceptual pre-typing or delineation (subdivision) of the survey area using existing ecological components such as surficial geology, parent material, topography, ecosite/vegetation or previous soil surveys. This is the preferred

and more commonly used method for more intense soil surveys such as those required for the PDA/C&R Plan.

Due to the poorly defined nature of vegetation boundaries, it is strongly recommended that ecosite/vegetation information be only used for stratification purposes in combination with other ecological components such as surficial geology and topography.

Two types of soil inspections can typically be completed. Deep soil inspections allow the surveyor to describe soils to a depth of approximately 100 cm in mineral soils for the purposes of identifying and classifying soil series and land capability. Sampling of deep soil inspection sites is required for every major soil series encountered in the proposed disturbance. To help confirm topsoil and subsoil thicknesses, shallower soil inspections may be completed to the total thickness of the subsoil or 30 cm of the subsoil, which ever is less. In organic soils, observations are made to mineral contact or a depth of greater than 160 cm. It is recommended that sandy soils be observed to a finer textured contact or a depth of 100 cm at all inspection sites; that is, shallow soil inspections should not be applied to sandy soils. In many regions of northern Alberta, sandy soils (generally Brunisols) overlie glacial till or other finer textured materials within 100 cm of the soil surface. In these cases, it is important to obtain information about the depth and nature of the underlying layer in order to provide adequate information for determining the Land Capability Classification (LCC) of these soils.

Sampling and analysis of soil at inspection sites may vary depending on their purpose such as taxonomic/mapping, LCC ratings, reclamation suitability ratings. For the most representative information, it is necessary that the collection of samples and analyses be completed for inspection sites representing each soil series located within the proposed disturbances.

4.2 SOIL INFORMATION

At each established inspection site, soil attributes will be recorded. Information to be captured at each deep inspection site includes:

- soil classification and soil horizons according to the *Canadian System of Soil Classification - 3rd Edition* (Soil Classification Working Group, 1998), including all distinguishing parameters required for complete classification (e.g., pH, colour, structure);
- organic matter type and thickness (L, F, H and O layers);
- soil horizon properties, including: horizon designation, horizon sequence, horizon thickness, horizon depth, texture, structure, consistence (aggregate strength), root abundance, root orientation, root distribution depth of major root zone, depth to water table, and coarse fragment content or surface stoniness; effervescence and salt crystals;
- colour contrast between horizons and colour codes using Munsell colour charts for all soil horizons (where required for classification);
- moisture and nutrient regimes;
- soil profile photos (where applicable, to assist soil classification); and

- surface and internal drainage characteristics including: class, seepage depth, mottle presence, size and contrast, and gleyed horizons.

Information to be captured at each shallow soil inspection site includes:

- soil horizon (L,F,H and A horizons up to 30 cm) classification according to *the Canadian System of Soil Classification - 3rd Edition* (Soil Classification Working Group, 1998);
- limited field verification of soil series and spatial distribution;
- thickness of the topsoil horizons, including the LFH, O and A horizons; and
- thickness of B-horizon subsoil to the total thickness of the subsoil or 30 cm of the subsoil, which ever is less.

Chemistry information will be captured for each soil series. Samples must be collected from the footprint and parameters include:

- pH;
- EC;
- SAR;
- Saturation Percentage;
- Particle Size Analysis;
- Total Nitrogen;
- Total Organic Carbon;
- Bulk Density; and
- Calcium Carbonate Equivalent.

4.3 TERRAIN INFORMATION

At each established inspection location, attributes of the terrain should be recorded. Critical information to be captured at each site includes:

- topography: slope class and aspect;
- surface and internal drainage;
- current land-use of the site;
- type of parent material;
- presence of surface stones; and
- existing instability, erosion or gully features.

The recommended inventory protocols for terrain and landscape descriptions are those in *Canadian System of Soil Classification - 3rd Edition, Chapter 17* (Soil Classification Working Group, 1998).

4.4 VEGETATION INFORMATION

Background vegetation and ecosite map information is often available from a variety of sources including the EIA and AVI for a project area. It is recommended that this information be applied

only to provide initial ecosite phase information for the proposed disturbance area as well as to define the vegetation and ecosite field sampling program to be conducted. The field sampling program should be conducted at a sampling intensity level that is adequate to confirm and further characterize the initial classifications derived from EIA and AVI information and should include a minimum of one sample location in each ecosite phase polygon. Sample locations should be established in representative areas of an ecosite phase (Beckingham and Archibald, 1996); these areas are typically homogenous in slope, soil type, plant cover, and overstory conditions. Sampling in areas that are located in transitional ecosite areas or indicate signs of edge effects (i.e., close proximity to disturbances or cleared areas) should be avoided. The intent of the ecosite field survey is to confirm the local ecosites as derived from the EIA and AVI information and to provide more detailed, site-specific mapping at the scale of the pre-disturbance assessment. This sampling program may be conducted in conjunction with either the rare plant or the soil surveys.

At each established sample location, vegetation attributes should be recorded. At a minimum, the following is essential information that should be captured at each inspection site:

- ecosite phase classification (as per Beckingham and Archibald, 1996);
- list of characteristic tree, shrub and herb and non-vascular species (as per Beckingham and Archibald, 1996) and their associated per cent plant cover or range of percent plant cover;
- identification of vegetation types or conditions that may require special consideration;
- representative ecosite photos; and
- occurrences of weed or invasive species (where applicable; including plant cover, infestation level, and phenology). The identification of weed species on a development site should be recorded through the completion of the R&R / 03-4 *Weeds on Industrial Development Sites – Regulation and Guidelines* weed survey documentation.

4.5 RARE PLANT SURVEYS

A rare plant survey must be included as part of a PDA/C&R Plan to describe the presence, if any, of species listed on the Alberta Natural Heritage Information Centre (2008) Tracking List (or on Schedule 1 of the Federal Species at Risk Act. Surveys should be conducted in accordance with the *Guidelines for Rare Plant Surveys in Alberta* (Alberta Native Plant Council, 2000).

All species identified as part of the PDA/C&R Plan field assessments that are on the ANHIC rare element species list must be recorded and submitted to ANHIC.

5.0 REPORTING OF A PRE-DISTURBANCE ASSESSMENT AND CONSERVATION & RECLAMATION PLAN

The purpose of this section is to provide an outline and overview of the submission content.

5.1 COVER LETTER SUBMISSION

A standardized cover letter should be submitted with each PDA/C&R Plan submitted to AENV (Example provided in Appendix A) that summarizes the general information supporting the PDA/C&R Plan submission. The cover letter includes the following:

New PDA/C&R Plan:	Select this box if this is the first submission of a PDA/C&R Plan for this proposed land disturbance.
Revision to PDA/C&R Plan:	Select this box if there have been any revisions to the original PDA/C&R Plan submission for this proposed land disturbance. This includes any documents supporting the Supplemental Information Requests.
Date Submitted:	Enter the date on which the PDA/C&R Plan was submitted to AENV for initial review. This date will change with each revised submission of the PDA/C&R Plan.
Proposed Disturbance/ PDA Name/	Enter the name of the proposed disturbance.
Legal Land Description:	Enter the legal land description(s) of the project.
EPEA Approval Number:	Enter the EPEA Approval number as assigned by AENV from the original project Application.
EPEA Approval Project Name:	Enter the EPEA Approval project name from the original project Application.
Name of Approval Holder:	Enter the name of the Company which holds the above EPEA Approval.
Company Contact Person:	Provide the name of the person (and contact information – phone number/email) who can be contacted to answer any questions regarding the information contained in the PDA/C&R Plan.

Individual/Company responsible for the PDA/C&R Plan on-site assessment and reporting:

Enter the name of the individual(s) or company (plus contact information) that completed the on-site and report assessment.

Date of Site Assessment(s): Include the date(s) when the on-site assessment for the PDA/C&R Plan was conducted.

Date of Planned Vegetation Clearing: Include the proposed date(s) of vegetation clearing.

Date of Planned Soil Salvage Start: Include the date(s) when soil salvage is to commence.

Content Requirements Checklist: Attach the completed Content Requirements Checklist.

5.2 EXECUTIVE SUMMARY

An executive summary should be provided for each PDA/C&R Plan submitted. This summary should highlight the key considerations of the baseline information, construction, operations, and reclamation phases for the proposed land disturbance. As well, this summary should highlight specific environmental issues and considerations associated with the development together with any specific mitigation techniques or variances.

5.3 OVERVIEW

This section provides an overview of the proposed disturbance in terms of its regional setting as part of a larger project, size of disturbance, associated infrastructure, and general timing of development. Information requirements for this section include all of the following:

- location of proposed disturbances, including legal land description, UTM corner locations (optional) of proposed non-linear developments, and start/end and major inflections of linear developments;
- maps, and/or air photo(s) of the proposed development presented in relation to other facilities and known environmental features (the location information indicated above can be provided on these maps);
- a summary of the dimensions and area of proposed disturbance (ha) subdivided by the different components of the development (e.g., well pad, access road, storage areas, etc.);
- biophysical and physiographic overview (e.g., Natural Region, Green/White area, etc.);
- a detailed development plan illustrating the locations of **ALL** facilities proposed for disturbance in this PDA/C&R Plan including, if applicable, central processing facilities, well pads, access roads, pipelines, borrow pits, and other infrastructure;

- a description and confirmation that the proposed disturbance is within the scope of the project as described in the EPEA Application, EIA and as approved by the EPEA Approval;
- Construction methodology (construction methodologies tend to be quite standard over time. This information can, therefore, be provided for each PDA/C&R Plan Submission or can be submitted once annually and be referenced in subsequent PDA/C&R Plan submissions. If submitted once annually, the document must cover methodologies for all types of facilities (e.g., well pads, roads, pipelines, borrow pits, etc.) as well as different terrain types (i.e. upland and wetland); and
- Schedule for disturbance (including proposed completion date (s)).

5.4 METHODS

A methods section is required as a component of the PDA/C&R Plan submission. This section should detail the methods used in all aspects of the PDA/C&R Plan development. This section should be clearly defined and subdivided based on the different aspects of the PDA/C&R Plan. Method descriptions should include, but are not limited to:

- collection of background information;
- field data collection;
- sample analysis;
- post field analysis (including Land Capability Classification (LCC) determination);
- spatial analysis; and
- reporting.

For PDA/C&R Plan submissions containing multiple land disturbances, it may be appropriate for a single methods section located near the beginning of the submission to cover all facilities proposed for disturbance. Similarly, if an Approval holder submits numerous PDA/C&R Plans each year, it may be appropriate to prepare and submit (annually) a separate methodology document to which reference is made in the individual PDA/C&R Plan submissions. Such an approach should be discussed and confirmed with Alberta Environment.

5.5 PRE-DISTURBANCE CONDITIONS

The purpose of this section of the PDA/C&R Plan is to capture the baseline conditions for a proposed site prior to land disturbance. These baseline conditions form the basis for the development of a site-specific conservation plan during the construction phase and for use as a guide in achieving successful reclamation upon facility closure. The description of the pre-disturbance conditions is subdivided into the following eight categories, all of which must be addressed in order to complete the PDA/C&R Plan requirements.

If a previously disturbed area exists within the new proposed land disturbance area, provide description of the nature of the existing disturbance, the current status of the existing disturbance (cleared, soil salvaged, reclaimed with soil replacement, reclaimed with vegetation

re-establishment), any available pre-disturbance information, locations and content of existing reclamation material stockpiles, and if soils have not been salvaged from the area include current soil inspection information for this area.

5.5.1 Baseline Soils

The characterization of the baseline soil conditions including an inventory of the different soils found at the site is a critical step in the development of the PDA/C&R Plan. This information forms the basis for conservation plans and acts as benchmark against which the final reclamation can be assessed.

The description of baseline soil conditions must be derived directly from the on-site assessment of the proposed land disturbance. Soil mapping is to be conducted for each land disturbance through the delineation of unique soil map units derived form the soil series found. The description of baseline soil conditions should include the following information:

- based on the on-site assessment, map(s) and/or air photo(s) showing labelled inspection locations, topsoil depths at each inspection point, baseline soil map units by soil series;
- aerial extents of baseline soil map unit areas within and adjacent to the proposed land disturbance site;
- summary description of each mapped soil map unit including but not limited to the soil series comprising each map unit, average topsoil depth, range of topsoil depth, colour contrast between topsoil and subsoil, variants present within mapped unit (if any), moisture regime, nutrient regime, slope range, parent material, and reclamation suitability rating of topsoil and subsoil according to the *Soil Quality Criteria Relative To Disturbance And Reclamation* (Alberta Agriculture 1987);
- soil classification and soil horizons according to the *Canadian System of Soil Classification - 3rd Edition* (Soil Classification Working Group, 1998), including all distinguishing parameters required for complete classification (e.g., pH, colour, structure);
- organic matter type and thickness (L, F, H and O layers);
- soil horizon properties, including: horizon designation, horizon sequence, horizon thickness, horizon depth, texture, structure, consistence (aggregate strength), root abundance, root orientation, root distribution depth of major root zone, depth to water table, and coarse fragment content or surface stoniness; effervescence and salt crystals
- colour contrast between horizons and color codes using Munsell colour charts for all soil horizons (where required for classification);
- soil profile photos (where applicable, to assist soil classification);
- surface and internal drainage characteristics including: class, seepage depth, mottle presence, size and contrast, and gleyed horizons;
- soil chemistry information for each analyzed soil series within the footprint area;
- average topsoil depths for each baseline soil map unit, separated by proposed land disturbance (e.g., access road and well pad); and
- thickness of B-horizon subsoil.

5.5.2 Terrain/Topography

A summary paragraph should be included describing the general pre-disturbance landscape conditions, including topography, relief, known parent materials, drainage characteristics. A general description of terrain with slope classification (as identified in the *Canadian System of Soil Classification*, *Chapter 17* (Soil Classification Working Group, 1998)) should be included. A baseline map and/or air photo showing pre-disturbance topographical contours of 1 m both within and immediately adjacent to the proposed disturbance areas are required in the PDA/C&R Plan. Contours can be presented on the baseline soil map or on a separate map.

5.5.3 Land Capability Classification

The determination of the baseline Land Capability Classification (LCC) conditions should be presented in a separate section as the LCC assigns a rating to reclaimed and natural sites using specified soil and landscape properties and could serve as one of the tools against which final reclamation can be assessed. Given the identified deficiencies in the *Land Capability Classification of Forest Ecosystems in the Oil Sands Region, 3rd Edition* (Alberta Environment 2006, as amended) and the recommendations provided by the Cumulative Environmental Management Association (CEMA), AENV recognizes the need for further evaluation of the LCC and its application to In-Situ Oil Sands Projects and further recognizes that the PDA/C&R Plan Reporting requirements related to LCC may be subject to future modifications.

Provide a map and a classification of pre-disturbance conditions using the *Land Capability Classification of Forest Ecosystems in the Oil Sands Region, 3rd Edition* (Alberta Environment 2006, as amendment) including analytical results and calculations. The determination of the baseline LCC must be derived directly from the on-site assessment of the proposed land disturbance footprint. This baseline information should be presented on a figure/map as described in *Land Capability Classification for Forest Ecosystems in the Oil Sands Region, 3rd Edition* (AENV 2006, as amended), per Section 5.0 (Mapping Applications), Table 15 (Mapping conventions regarding polygon size) and Table 16 (Mapping conventions to indicate purity of soil polygons).

5.5.4 Reclamation Suitability

During the development of the site-specific conservation & reclamation plan for the PDA/C&R Plan it is important to have information on the reclamation suitability of the soil material using the *Soil Quality Criteria Relative to Disturbance and Reclamation* (Alberta Agriculture 1987). This information is useful for identifying soils requiring special handling due to parameters such as salinity and sodicity. Both upper lift and lower lift soil materials as defined in the *Soil Quality Criteria Relative to Disturbance and Reclamation* (Alberta Agriculture 1987) must be evaluated. Samples for the purpose of deriving a suitability rating should be taken and analysed from sites within the proposed disturbance footprints. All the major mineral soil series to be salvaged near and within the proposed disturbance footprints must be represented by ratings.

5.5.5 Ecosite Description

A description of baseline vegetation must be included as part of the PDA/C&R Plan. This description should characterize each ecological class including ecosite phases, disturbance classes, and other natural vegetation classes (e.g., burned/regenerating forests). This baseline ecosystem should be classified to the ecosite phase level based on Beckingham and Archibald (1996). The following information should be presented:

- labelled inspection locations displayed on a map;
- ecosite phase classes within and adjacent to the proposed disturbance areas displayed on a map (ecosite phase information should be provided for an area of 50-100 m adjacent to the proposed disturbance footprint. This information can be based on air photo interpretation and extrapolation of inspection site data – no site inspections are required in these areas);
- area (in ha) of each ecosite phase in table format;
- a list of characteristic species, site characteristics and forest characteristics for each ecosite phase;
- identification of particular ecosite phases or site conditions that may require special consideration; and
- where appropriate, photographs of each ecosite phase from the on-site assessment.

As part of the baseline description, a discussion of wetland distribution should be included in the PDA/C&R Plan. This description of wetlands should follow the ecosite phase classification (Beckingham and Archibald, 1996) or the Alberta Wetland Inventory (AWI) classification system (Halsey and Vitt, 1996). This description can be amended to the vegetation discussion and may occur as text or figures within the PDA/C&R Plan document. At a minimum, each wetland class should be described in terms of the area (in hectares) of each wetland type and mapped to show distribution in and adjacent to the proposed development area. Detailed description of wetlands is considered optional, but may include the following attributes:

- depth to water, for peatland classes, or mean water depth for open water classes;
- basic water chemistry including pH and electrical conductivity;
- peat depth;
- depth to permafrost (if present);
- dominant vegetation structure – treed, shrubby, graminoid, or non-vegetated; and
- description of vegetation patterns (if present).

5.5.6 Rare Plant Documentation

A section discussing the rare plants identified at the site must be included. This discussion will follow the direction of the *Guidelines for Rare Plant Surveys in Alberta* (Alberta Native Plant Council 2000), detailing:

- locations of observed individuals or populations;

- date of observations (including repeated observations, if applicable);
- details on specimens collected and storage location;
- on-site photographs of each species observed;
- number of individuals, estimated density (#/m^2) or approximate coverage (in m^2) for colonial species;
- number of individuals at each phenological stage (growth/flowering/fruiting) at each date observed;
- ecosite phase and microhabitat description of the observation site;
- associated species at the observation site; and
- site conditions (i.e., slope, aspect, site position, level of disturbance, moisture regime, shade level, soil/substrate condition, etc.) at the observation site.

An ANPC *Rare Native Plant Report Form* must be appended to the report and should be submitted to ANHIC. Confirmation of identification from ANHIC may be required for some species. If species are unconfirmed at the date of submission, this must be stated and a confirmation update provided as a follow-up letter.

5.5.7 Weed Identification

Occurrences of weed or invasive species and their locations should be provided (where applicable; including plant cover, infestation level, and phenology).

5.6 CONSERVATION & RECLAMATION PLAN

The purpose of this section is to outline a detailed, site-specific Conservation & reclamation Plan based on current knowledge and best practices for achieving successful reclamation. This plan uses the site-specific information collected in the baseline assessment to develop recommendations for soil salvage and facility reclamation. It is important to accurately detail the construction methods and conservation plan to be employed at the proposed land disturbance and to provide the estimated volumes of salvageable soil. The site reclamation plan should detail all aspects of facility reclamation and identify the proposed reclamation strategy. Reference should be made to applicable EPEA Approval conditions when completing this section of the PDA/C&R Plan. It is also strongly recommended that the C&R Plan be developed in close consultation with the operator's construction and reclamation personnel.

5.6.1 Construction Plan

As an introduction to the conservation & reclamation section, a summary of the proposed construction plan for the proposed land disturbance should be presented. This construction plan should include an overview of the proposed construction techniques, including a description of areas requiring geotextile and/or off-site fill. The construction plan should be illustrated on a figure.

As well, this discussion should include proposed mitigation methodology with respect to environmentally sensitive sites, including identified rare plant locations and existing weed infestations.

A brief discussion of surface water management should be included in this section and should include the following:

- an indication of any requirements under the *Water Act*; and
- a drainage management plan (including culvert installations and removal).

5.6.2 Woody Debris Handling Plan

Site-specific plans for handling of non-merchantable timber and woody debris should be provided. Include a description of species composition, volume of woody debris expected, how it will be cleared, and how it will be handled (i.e. mulched, burned etc.). If the material will be mulched, describe the approximate size range of the mulched pieces and indicate how the mulch material will be handled in relation to the topsoil salvage plan for the site. ASRD Directive Number SD 2009-01 should be consulted.

5.6.3 Rare Plant Mitigation Plan

Describe any proposed mitigation measures for rare plant species identified in the proposed development area. Include specific details of the mitigation plan including timing considerations and post-mitigation monitoring plans. For species identified in areas adjacent to but not directly impacted by the proposed disturbances, discuss plans for monitoring to evaluate for secondary impacts such as impacts due to erosion, sedimentation or changes in hydrology.

5.6.4 Weed Mitigation Plan

Describe any proposed mitigation measures or special soil handling procedures that pertain to any weed issues identified in the proposed disturbance area.

5.6.5 Soil Salvage Plan

A critical part of the PDA/C&R Plan is the site-specific soil salvage plan. The soil salvage plan for each proposed development area addresses both the salvage of topsoil and subsoil and must be based on the pre-disturbance baseline soil information gathered during the on-site assessment. The soil salvage plan must also include estimated soil salvage volumes that are calculated based on recorded soil depths across the site as well as proposed stockpile storage locations. The soil salvage plan must include the following:

- topsoil salvage depths and range of variability;
- detailed volume estimates of salvageable topsoil;
- topsoil storage location (illustrated on a figure);

- subsoil salvage depths (where required);
- detailed volume estimates of salvageable subsoil;
- subsoil storage location (illustrated on a figure);
- a clearly defined material balance discussion;
- identify any soil conditions that may require special consideration or handling techniques as well as a proposed mitigation approach (e.g., organic soil salvage, sodicity or salinity);
- if previously disturbed areas exist, describe the soils in the previously disturbed areas and describe how soil salvage in these areas will be addressed; and
- description of the potential for loss of topsoil and subsoil by wind and/or water erosion. (References to consult are the following: previous EIA's, *Soil Series Information for Reclamation Planning in Alberta Volume 1 and Volume 2*, Pedocan Land Evaluation Ltd., 1993 and *Revised Universal Soil Loss Equation for Application in Canada*, Agriculture and Agri-Food Canada, 2002.) Provide mitigative measures for potential loss of topsoil and subsoil for proposed disturbed areas.

5.6.6 Operations Plan

A description of the proposed activities associated with the operations phase of the proposed disturbance should be included. This discussion should include information regarding:

- proposed stockpile erosion and sediment control methodology;
- stockpile signage;
- potential temporary re-vegetation strategies;
- weed control;
- interim reclamation; and
- submission of annual documentation.

5.6.7 Reclamation Plan

A detailed description of the proposed activities associated with the reclamation phase of the proposed land disturbance must be included. This should highlight the site-specific overview of the reclamation plan for each disturbance area including an indication of how the fill and geotextile materials will be handled (re-contoured, removed, etc.) and how salvaged reclamation materials will be replaced.

The objective of the section is to provide conceptual site-specific information with respect to ecosite targets, LCC targets and revegetation plans. This plan should indicate how the proposed reclamation objectives for this proposed disturbance relate to and fit with the overall, landscape-level reclamation plans for the project as a whole.

If a Conservation & reclamation Business Plan exists (in association with borrow pits requiring a Surface Materials License (SML) under the *Public Lands Act*), this information can be used to satisfy the requirements of this section of the PDA/C&R Plan.

5.6.7.1 Post Reclamation Topography

The development of the post reclamation topography is important to the success of the reclaimed development. This section should include a discussion on site preparation methodology as well as how the pad fill materials and geotextile materials will be handled. This section should also indicate how the reclaimed site will blend into the overall regional landscape as well as the overall landscape-level reclamation/closure plan.

Information regarding the reclaimed topography should include:

- identification of any topographical conditions that may require special consideration as well as a proposed mitigation approach;
- post-reclamation goals for topography;
- description of reclaimed topography relative to surrounding topography;
- cross-sectional diagrams indicating conceptual post-reclamation topography;
- post-reclamation goals regarding drainage including discussion about wetland restoration (if applicable); and
- a plan outlining the re-establishment of local drainage patterns.

5.6.7.2 Soil Replacement Plan

A detailed soil replacement plan is required as part of the PDA/C&R Plan submission. This plan should include detailed descriptions of the soil replacement methodology and tabular descriptions indicating soil replacement depths by proposed land disturbance. A discussion of material balance should be included with reference to any discrepancies in reclamation volumes with proposed mitigation documented. The discussion of soil replacement must include the following information:

- subsoil replacement depth targets;
- topsoil replacement depth targets;
- the validity of the proposed topsoil and subsoil replacement depths in relation to the EPEA Approval requirements;
- inclusion of a Reclamation Material Balance (estimated volumes of soil material required to achieve the reclamation objective for the site balanced against the estimated volumes of the material salvaged and stored);
- identification of the post-reclamation goals for Land Capability (in tabular and figure form);
- identification of any soil conditions that may require special consideration or handling techniques, as well as a proposed mitigation approach (including de-compaction of subsoil, remediation of contaminants, organic soil handling, seasonal soil replacement, etc.);
- a discussion of erosion potential and mitigative measures for disturbed areas;
- a discussion of the potential for loss of topsoil and degradation of topsoil quality; and
- a discussion of soil replacement in relation to topography (especially for wet soils).

5.6.7.3 Revegetation Plan

The post reclamation vegetation plan is an important consideration of the PDA/C&R Plan. This discussion of post reclamation vegetation should be consistent with the revegetation plan as outlined in the EPEA Approval (if required) and should include:

- identification of post-reclamation goals for ecosite phase establishment;
- a seeding plan (including seed mix);
- a reforestation plan including information about areas where reforestation will occur, species that will be used, justification for any areas where reforestation is not proposed, and a vegetation management plan; and
- a weed control plan for the reclaimed site.

If an Approval holder submits numerous PDA/C&R Plans each year, it may be appropriate to prepare and submit (annually) a separate revegetation plan document to which reference is made in the individual PDA/C&R Plan submissions. Such an approach should be discussed and confirmed with Alberta Environment

Further information on current revegetation plans can be referenced at:
http://srd.alberta.ca/lands/managingpublicland/landinformation/nativeplantrevegetationguidelines/guidelines.aspx

6.0 DOCUMENT REFERENCES

All material should be referenced and provided in this section.

7.0 DOCUMENT APPENDICES

The following is a list of recommended appendices to be included in the PDA/C&R Plan submission, as applicable to the site:

- soil inspection site data including location and detailed profile and site information as outlined in sections 4.2, 4.3 and 5.5;
- lab analysis reports (summarized and lab reports);
- ANHIC rare plant form (where applicable);
- R&R / 03-4 *Weeds on Industrial Development Sites – Regulation and Guidelines* weed survey documentation; and
- LCCS calculation sheets.

8.0 SUGGESTED MAPPING COMPONENTS OF A PDA/C&R PLAN SUBMISSION

Suggested mapping components of a PDA/C&R Plan submission include:

- Figure 1: Overview map (appropriate regional scale of 1:30,000) of the area showing overall landscape and terrain, proximity to other developments and overall area features (lakes etc.), north arrow, and LSDs.

- Figure 2: Baseline Soil and Terrain Map: Presentation of topsoil salvage depths/organic material depths, sampling locations, shallow/deep soil inspection locations, soil map unit delineations, scale, legend, LCCs, contours (1 m intervals), labelling of proposed disturbance areas (pipeline/powerline, well site, borrow location etc.), north arrow (LSDs). Suggested Scale of 1:2,500 to 1:5,000 depending on size of the land disturbance.

- Figure 3: Baseline Ecosite Map: Presentation of ecosite polygon mapping, sampling locations, shallow/deep soil inspection locations, scale, legend, LCCs, contours (1 m intervals), labelling of proposed disturbance areas (pipeline/powerline, well site, borrow location etc.), north arrow (LSDs), suggested scale of 1:2,500 to 1:5,000 depending on size of the land disturbance.

- Figure 4: Construction Map/Soil Salvage Map: indication of soil storage locations (topsoil and subsoil stockpiles), soil stripping depths based on soil map units, area to be stripped or prepared for construction (deep organic designated for no stripping but cut and fill should be indicated) and illustrating areas to be disturbed for construction, same scale as Figure 2, legend of all features and line parameters, north arrow (LSD not required).

- Figure 5: Reclamation Map: indication of reclaimed topsoil depth targets per soil map unit, indication of target ecosite and target LCC, and post reclamation topographic condition. This figure should be a consistent scale with other figures in the document. Examples include (but are not limited to) post reclamation contours, post reclamation LCC/Ecosite maps and conceptual profile diagrams.

9.0 LITERATURE CITED

Agriculture and Agri-Food Canada. 2006. Alberta Soil Names File (Generation 3) User's Handbook. Edited by M.D. Bock, J.A. Brierley, B.D. Walker, C.J. Thomas and P.E. Smith. Accessed through The Alberta Soil Information Centre http://www.agric.gov.ab.ca/asic

Agriculture Canada. 1987. Soil Survey Handbook. Volume 1: Expert Committee on Soil Survey. Technical Bulletin 1987- 9E. Land Resource Research Centre, Agriculture Canada, Ottawa, ON.

Alberta Agriculture. 1987 (re-issued 1993). Soil quality criteria relative to disturbance and reclamation. Soil Quality Criteria Working Group, Alberta Soils Advisory Committee, Alberta Agriculture. Edmonton, AB.

Alberta Environment (AENV). 2006. Land Capability Classification for Forest Ecosystems in the Oil Sands. Volume 1: Field Manual for Land Capability Determination. Third Edition. Prepared by Cumulative Environmental Management Association (CEMA), Fort McMurray, AB.

Alberta Native Plant Council (ANPC). 2000. Guidelines for Rare Plant Surveys in Alberta. ANPC, Edmonton, AB. 12 pp.

Alberta Natural Heritage Information Centre (ANHIC). 2008. Website accessed March, 2008. http://www.tprc.alberta.ca/parks/heritageinfocentre/default.aspx

Beckingham, J.D. and J.H. Archibald. 1996. Field guide to ecosites of northern Alberta. Special Report 5. Northern Forestry Centre, Forestry Canada. Northwest Region. Edmonton, AB.

Halsey, L.A. and D.H. Vitt. 1996. Alberta Wetland Inventory. In Alberta Vegetation Inventory Standards Manual. Version 2.2. Alberta Environmental Protection.

Mapping Systems Working Group. 1981. A soil mapping system for Canada, Revised. Land Resource Research Institute Contribution No. 142. Research Branch, Agriculture Canada. Ottawa, Ontario. 94 pp.

Pedocan Land Evaluation Ltd., 1993. Soil Series Information for Reclamation Planning in Alberta. Alberta Conservation & reclamation Council Report No. RRTAC 93-7. ISBN 0-7732-6041-2.

Soil Classification Working Group. 1998. The Canadian System of Soil Classification, 3rd Edition. Publication 1646. Research Branch. Agriculture and Agri-Food Canada. Ottawa, ON.

Wall, G.J., D.R. Coote, E.A. Pringle and I.J. Shelton (editors). 2002 RUSLEFAC – Revised Universal Soil Loss Equation for Application in Canada: A Handbook for Estimating Soil Loss from Water Erosion in Canada. Research Branch, Agriculture and Agri-Food Canada. Ottawa Contribution No. 02-92. 117pp.

APPENDIX A

Submission Cover Letter

Government of Alberta
Environment

SUBMISSION COVER LETTER

PRE-DISTURBANCE ASSESSMENT and CONSERVATION & RECLAMATION PLAN

☐ **New PDA/C&R Plan Submission** ☐ **Revision to PDA/C&R Plan Submission**

General Submission Information (Required for all new and revised applications)

Date Submitted: dd/mm/yy

Proposed Disturbance Name/PDA Name:

Legal Land Description:

EPEA Approval Number:

EPEA Approval Project Name:

Name of Approval Holder:

Company Contact Information:

Company:

Address:

Phone:

e-mail:

Individual/Company responsible for the PDA/C&R Plan on-site assessment and reporting:

Contact Person: if different than above

Company:

Address:

Phone:

e-mail:

Date of Site Assessment(s): dd/mm/yy

Date of Planned Vegetation Clearing: dd/mm/yy

Date of Planned Soil Salvage Start: dd/mm/yy

Content Requirements Checklist Attached:

Submission Contents: (Identify all documents submitted under this cover)	**No. Copies**

Submission Amendment Information (To be completed for revised applications only)

Original Submission Date:

Previously Submitted Documents:

(Identify applicable original and supplemental documents previously submitted to AENV which are not included under this cover)

APPENDIX B

Content Requirements Checklist

Content Requirements Checklist Pre-Disturbance Assessment and Conservation & Reclamation Plan
GENERAL INFORMATION
❑ EPEA Approval holder;
❑ EPEA Approval number;
❑ proposed disturbance name and legal land description; and
❑ date submitted.
EXECUTIVE SUMMARY (Section 5.2 of Guideline)
❑ presentation of major aspects of report.
OVERVIEW (Section 5.3 of Guideline)
❑ location of proposed disturbance, including legal land description;
❑ maps, and/or air photo(s) and description, including legal land descriptions, of the proposed development and access route relation to other facilities and environmental features (minimum scale of 1:30,000);
❑ area and dimensions of proposed disturbance (ha);
❑ biophysical overview; e.g., Natural Region, Green/White area, etc.;
❑ detailed development plan illustrating the locations of ALL facilities proposed for disturbance including, if applicable, related: (mark with 'X' or 'NA')(central processing facilities, well pads, access roads, pipelines, borrow pits, other infrastructure (Has it been specified?);
❑ description, including figure(s) where appropriate, of how the proposed disturbance is within the scope of the project as described in the EPEA Application, EIA and as approved by the EPEA Approval;
❑ construction Methodology; and
❑ schedule for Disturbance (including completion date(s)).
METHODS (Section 5.4 of Guideline)
❑ description of the methods applied or reference to the methods if they are provided elsewhere (Appendix or external document).
PRE-DISTURBANCE CONDITIONS (Section 5.5 of Guideline)
❑ if previously disturbed areas exist: provide descriptions of the nature of the disturbance, current status of the disturbed area, and available pre-disturbance information; and
❑ provide information about existing stockpiles of soil salvaged from these areas.
Baseline Soils (Section 5.5.1 of the Guideline)
❑ soil survey based on Section 4.1 and 4.2 of the guidelines including soil inspection intensity as required in Table 1 of the guideline;
❑ soil Survey Map(s)/air photo(s) (1:5000 or larger) showing mapped soil units and delineating the extent of the units and their boundaries both within and immediately adjacent to the proposed disturbance areas;

Content Requirements Checklist **Pre-Disturbance Assessment and Conservation & Reclamation Plan**
❑ based on the on-site assessment, map(s) and/or air photo(s) showing labelled inspection locations, topsoil depths at each inspection point, baseline soil map units by soil series;
❑ aerial extents of baseline soil map unit areas within and adjacent to the proposed land disturbance site;
❑ summary description of each mapped soil map unit including, but not limited to, the soil series comprising each map unit, average topsoil depth, range of topsoil depth, colour contrast between topsoil and subsoil, variants present within mapped unit (if any), moisture regime, nutrient regime, slope range, parent material, and reclamation suitability rating of topsoil and subsoil according to the Soil Quality Criteria Relative To Disturbance And Reclamation (Alberta Agriculture 1987);
❑ soil classification and soil horizons according to the Canadian System of Soil Classification – 3rd Edition (Soil Classification Working Group, 1998), including all distinguishing parameters required for complete classification (e.g., pH, colour, structure);
❑ organic matter type and thickness (L, F, H and O layers);
❑ soil horizon properties, including: horizon designation, horizon sequence, horizon thickness, horizon depth, texture, structure, consistence (aggregate strength), root abundance, root orientation, root distribution depth of major root zone, depth to water table, and coarse fragment content or surface stoniness; effervescence and salt crystals;
❑ colour contrast between horizons and color codes using Munsell colour charts for all soil horizons (where required for classification);
❑ soil profile photos (where applicable, to assist soil classification);
❑ surface and internal drainage characteristics including: class, seepage depth, mottle presence, size and contrast, and gleyed horizons;
❑ soil chemistry information for each analyzed soil series within the footprint area;
❑ average topsoil depths for each baseline soil map unit, separated by proposed land disturbance (e.g., access road and well pad); and
❑ thickness of B-horizon subsoil.
Terrain/Topography (Section 5.5.2 of Guideline)
❑ a general description of terrain with slope classification; and
❑ map/air photo showing topographical contours (1 m contour intervals) both within and immediately adjacent to the proposed disturbance areas.
Land Capability Classification (Section 5.5.3 of Guideline)
❑ a map and a classification of pre-disturbance conditions using the *Land Capability Classification of Forest Ecosystems in the Oil Sands Region, 3rd Edition* (Alberta Environment 2006, as amended) including analytical results and calculations.
Reclamation Suitability (Section 5.5.4 of Guideline)
❑ reclamation suitability ratings of topsoil and subsoil for mapped soil types using *Soil Quality Criteria Relative to Disturbance and Reclamation* (Alberta Agriculture 1987).

Ecosite Description (Section 5.5.5 of Guideline)
❑ vegetation assessment of the ecosite phase level of classification (Beckingham and Archibald, 1996);
❑ labelled inspection locations displayed on a map;
❑ ecosite phase classes within and adjacent to the proposed disturbance areas displayed on a map (ecosite phase information should be provided for an area of 50-100 m adjacent to the proposed disturbance footprint. This information can be based on air photo interpretation and extrapolation of inspection site data – no site inspections are required in these areas);
❑ area (ha) of each ecosite phase in table format;
❑ a list of characteristic species, site characteristics and forest characteristics for each ecosite phase;
❑ identification of particular ecosite phases or site conditions that may require special consideration;
❑ where appropriate, photographs of each ecosite phase from the on-site assessment;
❑ a description of wetlands based on the ecosite phase classification (Beckingham and Archibald, 1996) or the Alberta Wetland Inventory (AWI) classification system (Halsey and Vitt, 1996);
❑ a description of each wetland class in terms of the area (in ha) of each wetland type; and
❑ a map to show distribution of wetlands in and adjacent to the proposed development area.
Rare Plant Documentation (Section 5.5.6 of Guideline)
❑ survey results, conducted as per Guidelines for Rare Plant Surveys in Alberta (Alberta Native Plant Council, 2000);
❑ description of rare plant potential locations and survey areas on a map;
❑ locations of observed individuals or populations;
❑ date of observations (including repeated observations, if applicable);
❑ details on specimens collected and storage location;
❑ on-site photographs of each species observed;
❑ number of individuals, estimated density (#/m^2) or approximate coverage (m^2) for colonial species;
❑ number of individuals at each phenological stage (growth/flowering/fruiting) at each date observed;
❑ ecosite phase and microhabitat description of the observation site;
❑ associated species at the observation site; and
❑ site conditions (i.e., slope, aspect, site position, level of disturbance, moisture regime, shade level, soil/substrate condition, etc.) at the observation site.

Weed Identification (Section 5.5.7 of Guideline)
❑ occurrences of weed or invasive species and their locations.
CONSERVATION & RECLAMATION PLAN (Section 5.6 of Guideline)
Construction Plan (Section 5.6.1 of Guideline)
❑ summary of the proposed construction plan for the proposed land disturbance should be presented. This construction plan should include an overview of the proposed construction techniques, including a description of areas requiring geotextile and/or off-site fill;
❑ an illustration of the construction plan on a figure; and
❑ a brief discussion of surface water management should be included in this section and should include the following: - an indication of any requirements under the Water Act; and - a drainage management plan (including culvert installations and removal).
Woody Debris Handling Plan (Section 5.6.2 of Guideline)
❑ site-specific plan for handling of non-merchantable timber and woody debris
Rare Plant Mitigation Plan (Section 5.6.3 of Guideline)
❑ a description of any proposed mitigation measures for rare plant species identified in the proposed development area. Include specific details of the mitigation plan including timing considerations and post-mitigation monitoring plans; and
❑ for species identified in areas adjacent to but not directly impacted by the proposed disturbances, a discussion of plans for monitoring to evaluate for secondary impacts such as impacts due to erosion, sedimentation or changes in hydrology.
Weed Mitigation Plan(Section 5.6.4 of Guideline)
❑ describe any proposed mitigation measures or special soil handling procedures that pertain to any weed issues identified in the proposed disturbance area.
Soil Salvage Plan (Section 5.6.5 of Guideline)
❑ discussion of potential for loss of topsoil and degradation of topsoil quality;
❑ topsoil salvage depths and range of variability;
❑ detailed volume estimates of salvageable topsoil;
❑ topsoil storage location (illustrated on a figure);
❑ subsoil salvage depths (where required);
❑ detailed volume estimates of salvageable subsoil;
❑ subsoil storage location (illustrated on a figure);
❑ a clearly defined material balance discussion;
❑ identification of any soil conditions that may require special consideration or handling techniques as well as a proposed mitigation approach (e.g., organic soil salvage, sodicity or salinity);
❑ if previously disturbed areas exist, describe the soils in the previously disturbed areas and describe how soil salvage in these areas will be addressed; and

❑ description of the potential for loss of topsoil and subsoil by wind and/or water erosion (References to consult are the following: previous EIA's, Soil Series Information for Reclamation Planning *in Alberta Volume 1 and Volume 2*, Pedocan Land Evaluation Ltd., 1993 and *Revised Universal Soil Loss Equation for Application in Canada*, Agriculture and Agri-Food Canada, 2002.) Provide mitigative measures for potential loss of topsoil and subsoil for proposed disturbed areas.
Operations Plan (Section 5.6.6 of Guideline)
❑ proposed stockpile erosion and sediment control methodology;
❑ stockpile signage;
❑ potential temporary re-vegetation strategies;
❑ weed control;
❑ interim reclamation; and
❑ submission of annual documentation.
Reclamation Plan (Section 5.6.7 of Guideline)
❑ a description of the proposed activities associated with the reclamation phase of the proposed land disturbance. This should highlight the site-specific overview of the reclamation plan for each disturbance area including an indication of how the fill and geotextile materials will be handled (re-contoured, removed, etc.) and how salvaged reclamation materials will be replaced;
❑ information with respect to ecosite phase targets, LCC targets and revegetation plans; and
❑ an indication of how the proposed reclamation objectives for this proposed disturbance relate to and fit with the overall, landscape-level reclamation plans for the project as a whole.
Post Reclamation Topography (Section 5.6.7.1 of Guideline)
❑ identification of any topographical conditions that may require special consideration as well as a proposed mitigation approach;
❑ post-reclamation goals for topography;
❑ description of reclaimed topography relative to surrounding topography;
❑ cross-sectional diagrams indicating conceptual post-reclamation topography;
❑ post-reclamation goals regarding drainage including discussion about wetland restoration (if applicable); and
❑ a plan outlining the re-establishment of local drainage patterns.
Soil Replacement Plan (Section 5.6.7.2 of Guideline)
❑ subsoil replacement depth targets;
❑ topsoil replacement depth targets;
❑ the validity of the proposed topsoil and subsoil replacement depths in relation to the EPEA Approval requirements;
❑ inclusion of a Reclamation Material Balance (estimated volumes of soil material required to achieve the reclamation objective for the site balanced against the estimated volumes of the

material salvaged and stored);

- ❑ identification of the post-reclamation goals for Land Capability
- ❑ identification of any soil conditions that may require special consideration or handling techniques, as well as a proposed mitigation approach (including de-compaction of subsoil, remediation of contaminants, organic soil handling, seasonal soil replacement, etc.);
- ❑ a discussion of erosion potential and mitigative measures for disturbed areas;
- ❑ a discussion of the potential for loss of topsoil and degradation of topsoil quality; and
- ❑ a discussion of soil replacement in relation to topography (especially for wet soils).

Revegetation Plan (Section 5.6.7.3 of Guideline)

- ❑ Identification of post-reclamation goals for ecosite phase establishment;
- ❑ a seeding plan (including seed mix);
- ❑ a reforestation plan including information about areas where reforestation will occur, species that will be used, justification for any areas where reforestation is not proposed, and a vegetation management plan; and
- ❑ a weed control plan for the reclaimed site.

REFERENCES (Section 6.0 of Guideline)

- ❑ a list of materials referenced in PDA/C&R Plan

APPENDICES (Section 7.0 of Guideline)

- ❑ soil inspection site data including location and detailed profile and site information as outlined in sections 4.2, 4.3 and 5.5;
- ❑ lab analysis reports (summarized and Lab reports);
- ❑ rare plant ANHIC rare plant form (where applicable);
- ❑ R&R / 03-4 *Weeds on Industrial Development Sites – Regulation and Guidelines* weed survey documentation; and
- ❑ LCCS calculation sheets.